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Kristine Koch

U.S. Environmental Protection Agency, Region 10

1200 Sixth Avenue, Suite 900, M/S ECL-115

Seattle, WA 98101-3140

**Re: Portland Harbor Superfund Site
Union Pacific's Dispute of Final Feasibility Study**

Dear Ms. Koch:

This letter is submitted by Union Pacific Railroad Company ("Union Pacific"). Union Pacific is a signatory to the 2001 Administrative Order on Consent for Remedial Investigation/ Feasibility Study ("AOC"), as amended, and a member of the Lower Willamette Group ("LWG"). Pursuant to section XVIII of the AOC, Union Pacific disputes several findings in EPA's Final Feasibility Study ("FS") for the Portland Harbor Superfund Site ("Site"). Union Pacific also signed the FS dispute letter submitted by seven other signatories to the AOC. This letter highlights significant concerns with the FS.

1. Overarching Concern

Under the Comprehensive Environmental Response Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9601 *et seq.*, and its implementing regulation, the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, EPA is required to use a specified framework and particular criteria for identifying and evaluating cleanup alternatives to address unacceptable risks posed by hazardous substances. EPA's national sediment guidance documents explain how the NCP framework should be utilized at sediment megasites.

While EPA has substantial discretion in how it evaluates cleanup alternatives and identifies a preferred alternative using the nine criteria for FS evaluations set forth in 40 C.F.R. § 300.430(e), the cleanup goals must be achievable through the implementation of the selected cleanup. *Contaminated Sediment Remediation for Hazardous Waste Sites, December 2005 ("Sediment Guidance")*.

Such is not the outcome of the FS for the Site. In failing to comply with requirements for evaluating cleanup alternatives in a FS, as described in more detail below, EPA Region 10 has generated a preferred alternative that requires attainment of a total PCB cleanup goal that is not achievable and sustainable, is far more disruptive than described by EPA, will take much longer to implement than predicted by EPA, will likely cost significantly more than estimated by EPA, and is therefore not cost-effective as required by the NCP. Further, the FS does not identify which areas currently pose the highest risk and should be prioritized for remediation.

This result is inconsistent with one of the fundamental principles of the Superfund program as expressed in the NCP Preamble: "...this process [the remedy selection process] considers the full range of factors pertinent to remedy selection and provides the flexibility necessary to ensure that remedial actions selected are sensible, reliable solutions for identified site problems." 55 FR 8700 (March 8, 1990).

The LWG's draft FS fulfilled the requirements of the law and EPA guidance, proposing a workable, common sense cleanup. EPA's unnecessary and inappropriate takeover of the FS from the LWG has diminished the quality and value of the FS. The LWG's 2012 draft FS incorporated reliable science, provided the required comparative analysis of alternatives, and relied on realistic estimates of cost and time necessary to perform work. The LWG was prepared to fully engage with EPA and resolve EPA's comments and concerns in order to produce a report that provided a credible basis for EPA's selection of a remedy that conformed to CERCLA, the NCP, and EPA guidance. EPA's unwarranted deviation from the RI/FS process agreed to by EPA in 2001 was an abuse of discretion and will not lead to an effective and timely cleanup.

Cleanup projects that are estimated to cost hundreds of millions, if not billions, of dollars must be evaluated and selected based on how effectively they will perform in the physical world. At this Site in particular, the impact of fast-flowing river dynamics on the schedule and cost of remediation are not sufficiently evaluated in the FS.

Union Pacific disputes the FS as a whole because it leads to a proposed cleanup project that has not been sufficiently evaluated as required under the NCP and has no realistic chance of being implemented as described by EPA. Union Pacific also disputes the determination that certain sediments in the vicinity of its railyard (the "Albina Yard") require remediation. Further specific bases for Union Pacific's dispute of the FS are set forth in the paragraphs below.

2. EPA's PCB Cleanup Goal is Not Achievable

The preliminary remediation goal ("PRG") for total PCBs in the FS is nine parts per billion ("ppb"). The basis for this value is that it is the "background" value determined by EPA in the RI. The cleanup goal for PCBs is highly significant because PCBs are driving over 90 percent of the risk at the Site.

Union Pacific disputes both that the background number is achievable at the Site and that it should be used as a cleanup goal. Neither CERCLA nor the NCP authorizes EPA to select cleanup goals that are not achievable. EPA's guidance states the FS should confirm that cleanup goals are achievable by the sediment cleanup itself. Sediment Guidance, page 2-15.

In section 7.2.2 of the RI, the upriver reach of the lower Willamette River extending from RM 15.3 to 28.4 was selected as the reference area for determining PCB background sediment concentrations. Although separated from the Site by anywhere from four to 17 miles, EPA chose this area because it is considered broadly representative of the upstream sediment loading to Portland Harbor. Based on its evaluation of data from this reference area, EPA determined the background concentration for PCBs for the Site is nine ppb.

The Lower Willamette Group disputed how EPA evaluated the data in determining background. In his letter dated March 24, 2015, denying the dispute, Richard Albright, the then-current Director of the Superfund program in Region 10, wrote at page 16:

I would like to emphasize that as noted by EPA's Response at p. 24, there are sources of contamination outside of the Site – both upriver of the Site and within the downtown reach – that may affect the ability of the cleanup efforts within the Site to equilibrate to the selected cleanup level regardless of whether the cleanup level is based on risk, regulatory standard or background. In this regard, the Site is similar to other urban sediment sites which CERCLA addresses like the Lower Duwamish Site in Seattle.

If the Site cannot “equilibrate” to nine ppb, the cleanup level will not be achieved by the sediment cleanup action. The LWG submitted comments to EPA explaining how equilibrium, not background, should be used to establish PRGs and evaluate FS alternatives. The final FS appears to disregard all of this information.

Perhaps the most reliable certainty at the Site is that the Lower Willamette River continuously flows in one direction, from south to north, without pause or deviation. As part of the flow, the river carries sediments, much of which are deposited within the Site. Equilibrium is the result, in part, of concentrations of contaminants in the incoming sediments from upstream. As strongly suggested by Rick Albright, active remediation within the Site cannot achieve concentrations lower than that of the equilibrium level.

The LWG estimated equilibrium concentrations based on existing RI empirical data, including deposited surface sediment data (from depositional areas upstream of the Site and from depositional areas within the upper reaches of the Site but apart from known source areas), sediment trap data, upstream suspended sediment data, and smallmouth bass fish tissue data from 2002, 2007, and 2012. The result of the LWG's evaluation of empirical data, which was presented to EPA in August 2014, is that the equilibrium value for total PCBs should be 20 ppb. The LWG advised that EPA should not select risk-based PRGs below equilibrium values, including for PCBs. EPA's failure to do so, and failure to explain why the FS does not incorporate any evaluation of equilibrium, is inconsistent with the reasoning of its own former Director and an array of real-world data, and undermines the presumption that its proposed cleanup goal for total PCBs is realistically achievable.

Further, EPA's failure to use reliable models to reasonably predict when cleanup goals will be attained is another significant omission in the FS. In effect, EPA has not included any credible information in the FS indicating that its cleanup goals, particularly for PCBs, are actually achievable and sustainable over the long-term at the Site. The importance of models (*e.g.*, sediment transport model and bed composition model) in making cleanup decisions at sediment sites is explained in detail in the *Sediment Guidance*, section 2.9. Such models are generally

used at large sediment sites (e.g., Lower Duwamish and Lower Passaic sites), but were not used here.

Union Pacific disputes both that the cleanup goal for PCBs is achievable at the Site and that it is consistent with the NCP.

3. Risk Management is Absent from FS Evaluation

Another fundamental flaw in the FS is the absence of credible risk management. Risk management in the Superfund program requires the consideration of the advantages and disadvantages of cleanup alternatives and a balancing of trade-offs. This analysis includes an evaluation of the uncertainties at the Site, including uncertainties in the reliability of the exposure data used to identify the risks. 40 C.F.R. § 300.430(e)(2)(i)(A)(4). Further, as noted in the NCP Preamble, “[t]he likelihood of the exposure actually occurring should be considered when deciding the appropriate level of remediation, to the degree that this likelihood can be determined.” 55 FR 8710 (March 1990).

As described in the *Sediment Guidance*: “A risk management process should be used to select a remedy designed to reduce the key human and ecological risks effectively.” *Sediment Guidance*, page 7-1. It is telling that the term “risk management” is never used in the FS.

At Portland Harbor, the risk assessments, particularly for human health, are built on a cascade of conservative assumptions regarding exposure and durations. Unacceptable risks to various consumers of fish are based on questionable assumptions of how many fish people eat, from which areas of the river, how the fish are cooked, and for how many years. Contrary to the NCP, the assumptions were not placed in an overall estimate that is conservative but within a realistic range of exposure as required by the NCP. NCP Preamble, 55 FR 8710. Further, the assumptions used at Portland Harbor are not compared to assumptions used at other sediment megasites (i.e., nowhere is there an explanation why people are more exposed to certain kinds of risk in Portland than they are in Seattle or Newark, for example).

Of equal importance is that EPA’s FS fails to document how the risk assumptions have been considered when evaluating alternatives. The FS describes what appear to be highly exaggerated risks at the Site. For example, the acceptable consumption rate is 6 fish meals every 10 years. EPA does not provide backup for how meals per 10 years were calculated or how it is consistent with the baseline risk assessment. Nor does EPA clarify whether resident fish caught from any location within the 10-mile river contribute to potential excess risk. In the absence of such information in the FS, it is not apparent that the reliability of the exposure assumptions has been sufficiently considered (i.e., whether an important element of risk management has even been conducted).

Finally, the FS does not identify which areas currently pose the highest risk and should be prioritized for remediation. At a 10-mile Site that, according to the FS, encompasses nearly 300 acres requiring active remediation and likely close to 20 years to perform the cleanup, it would seem necessary and prudent to establish a basis for prioritizing and sequencing the

cleanup of the higher risk areas. EPA's failure to do so is an indication that it is not effectively managing the risk.

Union Pacific asserts EPA has failed to comply with regulations and guidance because the FS fails to document that EPA included a legitimate risk management step in its evaluation and decision-making process. The absence of risk management means EPA has not demonstrated the preferred alternative represents the most appropriate solution for the Site.

Union Pacific disputes that the FS incorporates risk management as required by the NCP.

4. The FS Requires More Sediment Removal Than Necessary

"Principal threats are characterized as waste that cannot be reliably controlled in place, such as liquids, highly mobile materials (e.g., solvents), and high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure)." NCP Preamble at 55 FR 8703.

In the FS, EPA has designated large areas of sediments with relatively low concentrations as principal threat waste ("PTW") (e.g., above 200 ppb total PCBs) that must be removed from the Site, including near Union Pacific's Albina Yard. However, the FS fails to explain satisfactorily how sediments in these large areas are highly mobile or highly toxic *and* how they cannot reliably be contained in place.

The FS does not contain a credible conceptual site model that identifies the extent to which certain areas of sediments are "highly mobile" and need to be removed. Most areas of the Site are depositional, meaning that sediments in these areas are stable and likely to remain in place in the future. In many cases, where contaminant concentrations in surface sediments in these areas represent an unacceptable risk, such sediments can be reliably contained in place.

Nor are the PCB levels in the river "highly toxic". In the risk assessment, EPA identified unacceptable risks based on fish consumption, which is an *indirect* exposure pathway (i.e., people are not eating contaminated sediments). Consistent with acceptable risk assessment methodology, exposure assumptions were averaged over time and space to best represent potential *indirect* exposure to people eating fish. The exposure units for the fish consumption pathway ranged from site-wide to individual EPA river miles, depending on the home range of the fish species.

In its designation of PTW, however, the FS disregards acceptable methods for assessing indirect risk and identification of PTW thresholds. In the FS, any sediment that exceeds 200 ppb PCBs is deemed PTW. The FS does not explain or justify why sediment at such a relatively low concentration is "highly toxic" (i.e., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure). At many other sediment megasites around the country, EPA's *cleanup level* for total PCBs is 1 part per million. Sediment containing PCBs at 200 ppb is one-fifth of what is considered an acceptable cleanup level at these other sites. The FS's designation of "highly toxic" material at Portland Harbor is without basis, contrary to policy and practice elsewhere, and clearly not reasonable.

Further, as the LWG has explained to EPA, EPA's decision to cap, rather than remove, more highly contaminated sediments associated with the McCormick-Baxter site is inconsistent with its current position on treating principal threat waste elsewhere at the Site

Union Pacific disputes EPA's designation of principal threat waste at the Site.

5. The FS Substantially Underestimates the Impacts of Performing, and the Time and Cost to Perform, the Preferred Alternative

One of the key FS evaluation criteria in the NCP is short-term effectiveness, which requires consideration of the effects of the alternative during the construction and implementation phase until remedial response objectives are met. 40 C.F.R. § 300.430(e)(9)(iii)(E). At sediment sites, short-term risks associated with capping and dredging may include potential contaminant releases during such operations (which may increase fish tissue concentrations) as well as accidents to workers, disruptions to business and recreational uses, and other impacts to the community (e.g., from light, noise, and air emissions). *Sediment Guidance*, at page 7-9. At a site where the cleanup will take many years to perform, a realistic evaluation of the time to perform the cleanup also needs to be incorporated into the evaluation of short-term impacts.

The FS does not include a reasonable quantification of the above-described short-term impacts, such as realistic estimates of the extent of dredge releases (e.g., water quality impacts). For each more aggressive alternative, the FS simply says the short-term impacts will be "greater."

Moreover, the NCP requires not only an assessment of individual alternatives against each of the nine criteria but also "a comparative analysis that focuses upon the relative performance of each alternative against those criteria." 40 C.F.R. § 300.430(e)(9)(ii). The so-called comparative analysis in the FS is oversimplified and does not attempt to meaningfully consider the trade-offs between increasing short-term impacts and the alleged benefits of more expansive dredging and capping requirements. If, for example, the water quality impacts (and associated impacts to fish tissue concentrations) from dredging are increasingly significant as the extent of dredging and capping increases, then there should be corresponding increases in the benefits from performing such increasingly more aggressive approaches. However, the FS does not include a credible explanation of how the preferred alternative's combination of active remediation and monitored natural recovery achieves cleanup goals in a substantially shorter time than less aggressive alternatives using a different combination (i.e., more monitored natural recovery). The required balancing of trade-offs under the NCP is conspicuously absent from the FS.

In addition, the FS is wildly optimistic about the estimated time to perform each of the alternatives. In October 2016, the Port of Portland ("Port"), which has extensive experience with dredging projects, participated in a meeting with Jim Woolford, the head of EPA's national Superfund program, and explained that EPA's estimates of construction duration and cost were not reasonable and needed to be revised. On October 13, 2015, the LWG provided Mr. Woolford a memo which incorporated the Port's analysis (Enclosure 1). The FS fails to incorporate the Port/LWG's estimates and does not explain why it disagreed with them. Based on the memo, which incorporated the Port's real-life experience with dredging projects, it is very

likely that the magnitude and duration of short-term impacts associated with the cleanup are substantially underestimated in the FS.

Further, as noted in section 2 above, EPA's failure to use reliable models to predict when cleanup goals will be attained is a fundamental flaw in the FS. For example, Page ES-16 of the FS states as follows: "Alternative I achieves more interim targets than Alternative D and is therefore more reliable in achieving PRGs and RAOs in a reasonable time frame because it relies less on natural processes."

But there is no information in the FS that supports the apparent assertion that Alternative I will achieve PRGs and RAOs more quickly than Alternative D. In the absence of a reasonable basis to compare the time frames in which the cleanup goals will be attained, the trade-offs between increased short-term impacts and the long-term benefits of the cleanup cannot be made as required under the NCP.

Another significant omission in the FS is the absence of information to support the statutory determination of cost-effectiveness. As explained in the dispute letter submitted by a group of AOC signatories, significant categories of costs are either underestimated (e.g., engineering design, waste processing, water treatment, sheet pile barriers) or completely absent (e.g., pre-design investigation, agency oversight, and Oregon Department of State Lands fees for access, leases, and easements).

Second, the FS fails to examine and compare the relative magnitude of cost to effectiveness of each alternative individually and the cost and effectiveness of alternatives in relation to one another. See NCP Preamble at 55 FR 8728.

The LWG has submitted many comments to EPA about deficiencies in the draft FS. Most of the deficiencies remain unaddressed. Issues associated with the evaluation of short-term effectiveness, cost, and time are among significant concerns. However, just these concerns alone demonstrate a substantial weakness in the required evaluations in the FS and significantly impair any representation by EPA in the FS that the preferred alternative represents the best balance of the cleanup evaluation criteria.

Union Pacific disputes that EPA's evaluation of short-term impacts, cost-effectiveness, and time for construction of the cleanup are reasonable and in accordance with the NCP.

6. Sediments Near Albina Yard Do Not Require Cleanup

The FS preferred alternative identifies two areas of sediments between RM 10 and 11 that EPA has identified for cleanup, purportedly due to exceedances of the PCB remedial action level ("RAL"). EPA also identified these areas on Figure 3.2-3 as containing principal threat waste. This area of the Site is near Union Pacific's railyard at Albina Yard. Union Pacific disputes this determination, particularly the area from approximately RM 10.7 to RM 11 where there are no exceedances of the applicable RAL in surface or subsurface samples of sediments.

EPA's potential cleanup area near RM 10.7 appears to be based on a PCB exceedance in soil at one location on a 900-foot stretch of the riverbank. EPA included

riverbanks as part of its draft FS evaluation of alternatives, but did not identify Albina Yard as a site with "known contaminated riverbank" in section 1.2.3.5 of the FS.

Moreover, in its Final Remedial Investigation/Source Control Measures Evaluation Report for Albina Yard dated November 2010, which was reviewed and approved by Oregon DEQ, Union Pacific determined that the riverbank near Albina Yard had a low potential for erosion because it was highly vegetated and stabilized with rock/rip rap. Because PCB concentrations in the sediments are below the applicable RAL, and the riverbank is stable, this area of sediments should not be included as a potential cleanup area. Certainly, the FS contains no explanation for this area's inclusion as a potential cleanup area, much less as an area containing principal threat waste.

Union Pacific disputes the apparent determination that sediments near RM 10.7 require remediation and, for the reasons explained in detail in section 4 above, the designation of such sediments as principal threat waste.

7. Conclusion

Sediment megasites like the Portland Harbor Site are extremely challenging -- challenging to characterize the contamination and the dynamics of the river system, challenging to identify what are the significant risks, and challenging to evaluate alternatives to reduce such risks. Union Pacific appreciates the hard work, resources, and dedication EPA has devoted to the Site prior to and since the Site was added to the National Priorities List in 2000.

Nonetheless, Union Pacific is concerned that because EPA's FS does not comply in significant ways with regulatory requirements and guidance recommendations for sediment megasites, EPA's description of a preferred alternative is not realistic and will not achieve protection of human health and the environment for a reasonable cost and within a reasonable time frame. Union Pacific looks forward to further communication with EPA as its dispute of the FS is considered by EPA.

Please contact Tod Gold at 206.957.5953 if you have any questions about this letter.

Very truly yours,

Robert Bylsma / by permission ALA

Robert C. Bylsma

cc: Lori Cora

ENCLOSURE 1

ASSESSMENT OF DREDGING PRODUCTION RATES AND CONSTRUCTION DURATION ASSUMPTIONS ON EPA'S FS COST ESTIMATES

This memorandum discusses likely cost impacts associated with applying more realistic, longer sediment remediation construction durations to EPA's alternatives in Feasibility Study (FS) Sections 3 and 4. During recent senior manager discussions, Jim Woolford of EPA Headquarters requested that the LWG estimate the cost impacts associated with longer alternative construction durations. This request came about due to the LWG's expressed concerns about overly optimistic construction duration assumptions in EPA's FS.

Section 1 provides brief background on EPA and LWG construction duration estimates. Section 2 discusses the analysis of duration impacts on alternative costs as requested by Jim Woolford. Section 3 discusses the other LWG issues related to overly optimistic construction duration assumptions, given that the LWG's duration concerns are not limited to just the impact on FS costs. Finally, because construction durations are not the LWG's only concern regarding the high costs of EPA's alternatives, Section 4 compares construction duration impacts on cost to other EPA assumptions that appear to unnecessarily drive up the costs of the FS alternatives.

1 BACKGROUND ON CONSTRUCTION DURATION ESTIMATES

The LWG has consistently expressed concerns about and commented on EPA's construction duration assumptions. Attached is the LWG's January 15, 2014 memorandum to EPA providing the initial comments and concerns. These concerns include:

- **Dredging Days per Week.** EPA assumed 122 days per season during the construction window between July 1st and October 31st. That works out to 7 days per week. A more realistic assumption based on local project experience is 104 days per season, which excludes federal holidays and Sundays. Sundays are typically used for maintenance or schedule "make up" days.
- **Dredging Hours per Day.** EPA assumed 24 hours per day of dredging citing projects such as the Buffalo River, Indiana Harbor and Hudson River. The LWG common consultants and the Port of Portland have consistently indicated based on extensive local project experience with environmental and navigational dredging projects that the public will be resistant to 24/7 dredging and that 12 hours per day is a more realistic assumed work period for the FS.
- **Daily Production Rate.** EPA calculated daily production rates based on a theoretical analysis assuming certain cycle times, bucket size, percent bucket full, efficiencies, work hours per day, and assuming that three dredges work simultaneously. EPA also evaluated production rates for clamshell buckets and articulated arm dredges. EPA then supported their calculations by citing large environmental projects from around the country (see previous bullet). The 2012 draft FS presented a theoretical calculation for clamshell bucket dredges and compared the results to Portland region environmental dredging projects (which all used clamshell bucket dredges) that had similar types of disposal. LWG and EPA appear to agree that three dredges working simultaneously is a reasonable

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assumption for the FS. Expressed on a per dredge plant daily basis, EPA's analysis results in 1,300 cubic yards/12 hour day (or 2,700 cy/24 hr day) for clamshell bucket dredges and 575 cy/12 hr day (1,150 cy/24 hr day) for articulated arm dredges. EPA then assumed 55% of dredging would be conducted using cable arm dredges and 45% using articulated arm dredges, resulting in an average of 1,000 cy/12 hr day (2,000 cy/24 hr day). The 2012 draft FS analysis resulted in an overall production rate of 700 cy/12 hr day (1,400 cy/24 hr day). Because the 2012 draft FS estimates were validated using data from similar local dredging projects, the LWG believes the slower rates applied over a 12 hour day are more realistic assumptions for the FS.

- Bottleneck at the Offloading Facility.** The total seasonal dredge rate needs to consider all elements of the dredging process including dredging, handling, offloading, processing, sediment treatment (if needed), dewater collection and treatment, transport and disposal. One of the major bottlenecks for Portland Harbor will be the offloading facility. Based on a review of existing or potentially available shoreline properties, the Port of Portland determined that very large waterfront facilities (greater than 40 to 50 acres) centrally located within Portland Harbor are not available. The 2012 draft FS included a conceptual design for an offloading facility that could process 230,000 cy/season, consistent with the above draft FS production rates. The assumed facility would need to have enough room for offloading equipment, materials handling, stockpiling, and rail. The 2012 draft FS conceptually laid out a facility approximately 20 acres in size for the assumed quantity of material (230,000 cy/season). EPA assumed an offloading facility 140 acres in size to handle the approximately 720,000 cy/season resulting from the above EPA dredge production rate estimates. EPA indicated that such a facility would avoid process bottlenecks and therefore would have no impact on construction durations. Given the size of available properties for offloading facilities, EPA's assumption of no bottlenecks appears unrealistic.

Other likely bottlenecks besides the offloading facility that are associated with a higher production rate include multiple project coordination, vessel traffic coordination, material barge coordination, and rail/truck coordination. For example, on the Terminal 117 Duwamish waterway dredging project occasional delays were experienced due to the offloading facility unloading material from Boeing Plant 2 remediation work. This will be a common occurrence for Portland Harbor cleanup with multiple dredges working independently and using a common offloading facility. Coordinating materials barges for residual covers, backfill, and cap construction occurring at the same time as dredging will also be difficult. Both the availability of haul barges and materials will likely impact production rates. Finally, any little delay in rail or truck transport (accident, rail outage, etc.) will have a domino effect on all of the project schedules.

Taken together, EPA's FS construction duration assumptions result in highly optimistic construction durations that are approximately two to three times as fast as the construction durations for similarly sized alternatives in the 2012 draft FS.

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2 IMPACT OF DURATION ON COST

A complete determination of the impact of durations on EPA's cost estimates would require a detailed reconstruction of EPA's alternatives over a longer more realistic period. However, as with the technical aspects of EPA's FS, the document lacks the information necessary to evaluate EPA's estimation methods, much less check the accuracy of their cost estimates. Therefore, for this analysis the LWG focused on the following elements of EPA's FS cost estimate:

- **Mobilization/demobilization.** EPA's cost estimate assumed mobilization and demobilization was 1.6 percent of direct costs without contingency.
- **Project Management.** EPA's cost estimate assumed project management was 2 percent of the total direct cost and contingency.
- **Construction Management.** EPA's cost estimate assumed construction management was 3 percent of the total direct cost and contingency.
- **Offloading Facility Costs.** There are fixed costs for development of the offloading facility, but there are also yearly costs including rail gondola mobilization, property lease, labor for inspections and monitoring, and yearly monitoring reports.

This focused analysis did not attempt to adjust any of the direct capital costs outside of the offloading facility. Instead the analysis addressed the added time and costs for mobilization/demobilization, project management and construction management associated with the longer construction durations. To quantify these added costs, the LWG evaluated the increased time caused by the difference in seasonal dredging production rates estimated, which was 230,000 cy/season for LWG and approximately 730,000 cy/season for EPA¹. However, it appears that EPA used a smaller production rate than 730,000 cy/season, based on a comparison of the total dredge volume to the assumed dredge time presented in EPA's FS for each alternative. For instance, EPA's Alternative F appears to assume between approximately 490,000 and 650,000 cy/season of dredging, given that EPA states in Section 3.6.7 that between 4,382,540 to 5,843,380 cy will be dredged in 9 years.

The approximate ratio of 2 to 3 times the EPA durations based on the above production per season estimates was applied to the mobilization, project management, and construction management costs elements to estimate increased construction costs relative to these three cost elements. This increased cost was then added to the increased cost associated with the longer duration of operation of the offloading facility to obtain an overall added cost estimate. **This overall added cost was found to range from approximately 10 to 20 percent higher across all of EPA's alternatives as compared to EPA's estimated total capital costs.**

It is important to note that the above percent overall added costs are presented on a non-discounted cost basis (i.e., without the net present value calculation included). In a cost sensitivity analysis in Appendix G, EPA keeps all of the capital costs the same and then divides

¹ Note this seasonal production rate is not stated anywhere in EPA's FS or associated memoranda, but this is the calculated result based EPA's assumption of 2,000 cy/24 hour day/dredge plant, three dredge plants and 122 days dredging per season.

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those same costs evenly over a 50% longer or 50% shorter construction durations, which results in virtually no net change in capital costs. EPA then applies the discount value in the net present value calculation for these same expenditures over the increased and decreased periods to conclude that longer construction durations are less expensive on a net present value basis. Thus, the only changes in EPA's costs are caused by the net present value discounting assumptions, which is not a meaningful analysis of impacts of construction duration on costs. By this logic, all sediment remedies should be extended as long as possible in order to "reduce" the costs of the construction. Assessing the effect of duration on costs is better understood by evaluating non-discounted costs and evaluating how the capital costs will change over these durations as presented in the LWG's analysis above.

3 WIDER CONTEXT OF CONSTRUCTION DURATION ASSUMPTIONS

Cost is just one of many impacts on the overall FS evaluation associated with assuming optimistic shorter alternative construction durations. As discussed in the LWG's Significant Issue comments these other impacts include:

- **Short-term Impacts and Risks.** Overly optimistic shorter construction durations result in EPA understating the short term impacts and risks associated with all of EPA's alternatives. The optimistic and shorter construction durations decrease the amount of assumed short term impacts associated with:
 - Unavoidable dredge releases and associated water quality impacts and risks
 - Quality of life impacts associated with trucks, trains, and construction equipment moving through and around the surrounding neighborhoods and communities 24 hours per day
 - Quality of life impacts associated with nearshore and on-water construction activities including noise, lights, odors, and other impacts 24 hours per day
 - Worker injuries and potential deaths that are directly related to the number of hours worked as presented in the 2012 draft FS
- **Time to Achieve Remedial Action Objectives (RAOs).** EPA's FS describes the ability to estimate natural recovery and long-term outcomes of the alternatives, such as the time to achieve RAOs, as highly uncertain. Yet EPA asserts that the smaller alternatives (i.e., Alternatives B and D) will not achieve the RAOs as quickly as the larger alternatives (i.e., E, F, and G). In LWG's view, this is unsupported because EPA underestimates the duration of construction of all the alternatives. Using more realistic and longer construction durations clarifies that it is highly unlikely that the larger alternatives would be able to achieve RAOs sooner than the smaller alternatives. The LWG's Significant Issue comment 14d contains a simple analysis of the alternative construction durations that illustrates that EPA's qualitative conclusions regarding time to achieve RAOs is highly dependent on the optimistically short construction durations assumed by EPA.

As a result, EPA's overall qualitative evaluation of the alternatives overstates the overall protectiveness and effectiveness of the larger alternatives as compared to the smaller alternatives.

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EPA uses the overly optimistic construction durations to conclude that the larger alternatives will achieve RAOs more quickly and that fewer short term impacts will occur than is reasonable.

4 OTHER IMPORTANT COST FACTORS

The cost question posed by Jim Woolford links the issue of more realistic construction durations to the issue of the potentially increased costs associated with EPA's already high cost FS alternatives. Although realistic longer construction durations are estimated to range from a 10 to 20 percent increase in the cost of EPA's alternatives, construction duration is not the most important aspect of the LWG's concerns associated with EPA's FS alternative costs. Other factors that are equally or likely more important in driving up the assumed costs of EPA's alternatives include:

- Biased technology assignments, which favor generally more expensive dredging over often less expensive capping. The biases in EPA's technology assignment approach are discussed in the LWG's Significant Issue comment 1.
- The use of thermal desorption for 100% of removed Principal Threat Waste source material
- The use of Subtitle C disposal of 100% of removed Principal Threat Waste source material (even after treatment)
- Increased treatment and disposal requirements for EPA-determined PAH and DDx "highly toxic" Principal Threat Waste.
- EPA's inappropriate use and application of TPAH, DDx, and dioxin/furan Remedial Action Levels (RALs). The concerns regarding EPA's RALs are discussed in the LWG's Significant Issue comment 3.
- EPA's assumed use of sheetpile containment around the full extents of Principal Threat Waste source material, even in very deep water extending into the navigation channel
- Complete replacement of dredge volumes with clean backfill in many circumstances
- Widespread application of 5 percent activated carbon to caps and residual covers in all EPA designated Principle Threat Waste or "groundwater plume" areas
- Inclusion of riverbank soils volumes and remediation requirements in the sediments FS
- Potential additional treatment and disposal requirements related to inappropriate Resource Conservation Recovery Act (RCRA) and other hazardous waste determinations. The LWG's concerns regarding these waste determination issues are discussed in Significant Issue comment 18.

Also, as detailed in the LWG's Significant Issue comment 16, the actual costs for many of these factors are likely even higher than EPA's Appendix G cost estimates due to numerous omissions and inappropriate technical procedures in EPA's costing process. Consequently, the impact of durations on costs is likely not the LWG's primary concern regarding the underestimated high costs associated with EPA's FS alternatives.

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Attachment:

**January 15, 2014 LWG Memorandum to Chip Humphrey and Kristine Koch, EPA Regarding
Proposed Process for Incorporation of EPA's Dredge Production and Dredge Residual**

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MEMORANDUM

To: Chip Humphrey and Kristine Koch, U.S. Environmental Protection Agency, Region 10

From: Lower Willamette Group

Date: January 15, 2014

Re: Proposed Process for Incorporation of EPA's Dredge Production and Dredge Residual Recommendations for the Portland Harbor Feasibility Study

In a November 20, 2013 email, the U.S. Environmental Protection Agency (EPA) requested that the Lower Willamette Group (LWG) "propose a process that incorporates the dredge production and residual recommendations in the Corps memos that EPA sent to LWG on September 10, 2013." This memorandum proposes such a process for revision of the Portland Harbor Feasibility Study (FS). The memoranda in question were dated May 24, 2013, and May 27, 2013, for the dredge releases/residuals and dredging production rate, respectively. The memoranda were prepared by Paul Schroeder and Karl Gustavson of the U.S. Army Engineer Research and Development Center (ERDC). The LWG-proposed, revised FS process for each memorandum is addressed in the following sections.

DREDGING PRODUCTION RATES

As reviewed in the May 27, 2013 ERDC dredging production rate memorandum, the draft FS assumes a production rate of 700 cubic yards (cy) per day per dredge plant, which is 2,100 cy per day total, given that simultaneous operation of three dredge plants is assumed in the draft FS. The ERDC memorandum recommends, instead, a higher production rate of 1,867 cy per day per dredge plant, which is 5,601 cy per day, given the same assumption of three dredge plants operating simultaneously. The ERDC memorandum also suggests that further refinements to this rate could be conducted. The LWG has significant concerns about the optimistic nature of the ERDC production rate, including the following:

- The ERDC production rate is significantly higher than those implemented in similar projects in the Pacific Northwest, including T4 Early Action, Gasco Early Action, and Alcoa Vancouver (each in the 500 to 900 cy per day range); Zidell (less than 400 cy per day); Port of Olympia 2009 Interim Action (400 cy per day); East Waterway Duwamish Phase 1 Removal Action (up to 1800 cy per day); Boeing Plant 2 Duwamish, Season 1 (700 to 1000 cy per day); and the Head of Hylebos Waterway (722 to 1150 cy per day). (Citations are in the draft FS or can be supplied upon request).
- The ERDC memorandum cites non-Northwest projects where the highest production rates involve disposal directly into Confined Disposal Facilities, which may only apply to some Portland Harbor alternatives and, at best, a minority of the Portland Harbor sediments.
- The ERDC memorandum cites the Hudson Phase 2 project with a rate of 900 cy per dredge per day (or 2,700 cy per day for three dredge plants), which is only slightly higher than the total production rate used in the draft FS (2,100 cy per day).

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- The ERDC memorandum discusses consideration of, but largely ignores, specific local issues, such as available infrastructure as well as water transport, offloading, upland transportation, and disposal bottlenecks, which have been demonstrated constraints on other Pacific Northwest remedial dredging projects.
- The ERDC memorandum discusses the impacts of release/residual best management practices and performance standards on production rates but does not propose specific methods and standards that will allow the assumed higher production rates.
- The ERDC memorandum does not address in any detail the contracting, EPA oversight, and other implementation logistics for this complex site, which has a range of SMA-specific conditions and many responsible parties and contractors as discussed the draft FS. The Portland Harbor situation differs significantly from the situations that the ERDC cited at Hudson River, Buffalo River, and Indiana Harbor sites, all of which involve one responsible party and one contractor.

Range Evaluation Proposal

Despite these concerns, it is recognized that both the LWG and ERDC production rate estimates are attempts to predict a future condition that is unknown, including issues of the exact dredging methods, cut depths, and equipment to be used; the residuals and water quality controls and performance standards to be imposed; dewatering treatment requirements; the number of dredge plants that can be reasonably mobilized to the site for any given season; the exact offloading and transportation infrastructure to be used; the disposal destinations; contracting and performing parties logistics; and the period of day during which dredging will be allowed due to noise, light, traffic, and other community concerns. Given these uncertainties, the LWG proposes that the revised FS evaluate a range of potential dredge production rates and the impact of those ranges on remedial decisions.

If EPA is agreeable to a range evaluation approach for production rates, the LWG would want to discuss further with EPA the appropriate production rate ranges for such an evaluation. As noted in the draft FS, we believe the draft FS production rates are not the slowest possible production rates for real world environmental dredging in Portland Harbor. And as noted above, it also appears that the ERDC memorandum proposed rates are very optimistic for real world environmental dredging here. Although the LWG is amenable to discussing higher production rates than those in the draft FS as part of a revised FS range evaluation, the LWG believes the high range production rates should be considerably lower than the ERDC estimates for reasons stated above.

Regardless of the range of production rates used in a revised FS evaluation, the methods for such an evaluation would be the same for a variety of potential production rate ranges. Therefore, the methods for incorporating this type of range evaluation into the revised FS are discussed in the following subsection.

Range Evaluation Methods

Production rates are used in the FS to determine the implementation speed for removal, transport, and disposal required under each alternative. The production rate is an important, but not the

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sole, factor in determining the duration of each alternative. Duration can, in turn, impact the sequence of Sediment Management Areas (SMAs) addressed and directly impacts some of the unit cost calculations for each alternative (e.g., dredging unit cost). Duration and sequence can then impact the evaluation of each alternative's effectiveness and feasibility. Some components of the effectiveness evaluation, particularly the fate and transport modeling, specifically rely on the duration and sequence to estimate the impacts of each alternative. Therefore, if the production rates are varied, all of these other FS evaluation components would need to be revised as well.

For reasons discussed above, the LWG continues to believe that the draft FS production rates are reasonable estimates of real world Portland Harbor-specific conditions that already factor in a considerable amount of optimism (i.e., favoring higher production rates). Consequently, it appears appropriate to continue to use these production rates as the "base case" assumption that is used to develop the related FS evaluation components discussed above. In addition, for FS report schedule, cost, and logistical reasons, both EPA and the LWG have discussed the value in using the existing evaluations in the draft FS to continue to support the revised FS, where possible. Consequently, the LWG proposes that the range of dredge production rates only be used to calculate new durations for each alternative. The sequencing, costs, effectiveness (e.g., QEA Fate modeling), and feasibility calculations for each alternative in the revised FS would continue to use the "base case" from the draft FS production rates, sequences, and durations.

As determined through further EPA/LWG discussions, higher production rate-based durations would be presented and used in the alternatives evaluation sections of the revised FS (i.e., the detailed and comparative evaluations represented by the current draft FS Sections 8 and 9). Alternative evaluations that rely on or discuss durations of the alternatives would present the full range of durations as calculated in the range evaluation. This would include any detailed or comparative alternative evaluation tables or graphs that use duration as a metric. For tables, ranges of values would be presented. For graphs, any duration estimates would include error bars or similar indicators of shorter durations that could be attained using the higher production rates.

Finally, as discussed in Section 10 of the draft FS (see Section 10.3.5, 10.3.6, and Appendix U Table 7.1-1 for details), duration is a related metric to short-term effectiveness and implementability. (This should not be inferred to mean that duration is synonymous with or a replacement for the full evaluation of short-term effectiveness and implementability conducted in Sections 8 and 9.) As a result, duration is used to calculate the short-term effectiveness and implementability component scores within the overall summary scoring of alternatives in Section 10. To the extent that EPA desires to use such a scoring system for summarizing the evaluation of alternatives in the revised FS, the effect of the duration ranges proposed in this memorandum could be incorporated into the overall summary score ranges.

DREDGE RESIDUALS

The May 24, 2013 ERDC dredge residuals memorandum recommends a different method for the calculation of residuals than that used in the fate and transport modeling evaluations in the draft FS. The details of the ERDC-proposed method are provided in the recommendations

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section of that memorandum and do not need to be repeated here. Again, the LWG has some specific concerns about the information supporting the ERDC-recommended residual calculation method, including the following:

- All but the Port of Olympia and possibly the West Branch Calumet projects from the post-dredge “cover” mixing citations provided by ERDC actually refer to capping projects, where installation methods are specifically targeted to minimize mixing, which is usually not the case for post-dredge cover project methods. For post dredge covers the material is usually placed under the assumption that mixing will take place during construction and in the future due to natural forces. Using capping methods for post dredge cover placement would greatly increase the time, implementability issues, and expense of completing dredging in each sediment management area.
- The Boeing Plant 2 project, referred to as demonstrating “improved dredging and residuals management,” collected insufficient data to assess residuals or the potential release rates associated with them, as this was not the intent of the post-dredge sampling program. For example, dredging was conducted to native clean sand, where 1-foot-long cores were collected of the post-dredge surface, and the entire 1-foot interval was analyzed as a composite. A composite sample of this length would be expected to dilute any potential for an accurate measure of the residuals layer actually present, particularly at low contaminant of concern concentrations.

The draft FS residuals modeling assumptions are based on empirical data on residuals management strategies at other sites, and thus, the LWG believes residuals modeling assumptions are appropriate for an FS-level evaluation. Nonetheless, the LWG agrees that the fate and transport modeling residual calculation was intended to be an estimate of post-dredging residuals to allow easier parameterization of a detailed and spatially varied set of model conditions, not a design level calculation. For this reason, there is a separate Appendix Ib, which presents a more detailed evaluation of dredge residuals production and concentration impacts that would have been difficult to incorporate fully into the fate and transport model. We agree that there are uncertainties in this estimate that are difficult to quantify given that construction methods are unknown at this time, including exact dredge equipment, dredge cut specifications, and EPA’s eventual requirements for residuals cleanup passes and cover placement. Note that the draft FS assumes one cleanup pass followed by post dredge cover placement, and the LWG proposes to retain these assumptions for the revised FS.

The LWG proposes a range evaluation that uses the ERDC-specified residuals calculation methods, while continuing to use the draft FS assumptions of one cleanup pass followed by post dredge cover placement. As with the production rates, we continue to believe that the methods used to parameterize residuals effects in the FS fate and transport model are sufficiently accurate for the draft FS evaluations. In addition, propagating changes to the residuals calculations through the entire FS, including fate and transport model parameterization and model runs, would be time and resource intensive. Instead, we propose that for each alternative a static surface be calculated that represents the entire site after all SMAs are remediated.

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Currently, the model calculates the post-dredge surfaces by SMA, and then the model fate and transport processes are allowed to function while other SMAs are being actively remediated in a specified sequence. For the residuals range evaluation for each alternative, the post-dredge surfaces will be calculated for all the SMAs at once, using both the current draft FS methods and the ERDC-recommended methods. These overall surface sediment concentrations can then be compared between the two methods to determine how much difference is created in Surface-area Weighted Average Concentrations (SWACs). The SWACs will be calculated on a model grid spatial scale such that SWACs over a wide range of spatial scales can be understood (e.g., site-wide, river segment, and river mile). Color-coded maps showing the magnitude of SWAC differences in each model grid cell can be developed to highlight areas of greater and lesser variation between the two methods.

This range evaluation information would provide additional details to support a discussion in the revised FS on a representative range of impacts of dredge residuals on remediation effectiveness as currently discussed and modeled in the draft FS. By comparing existing draft FS model run SWACs over time to the potential variation in starting SWACs after construction, specific conclusions can be reached about the potential for varying residuals levels to change the outcome of each alternative. For example, if the static SWACs for the two residual calculation methods vary by 5 parts per billion (ppb) in and around a particular SMA, and the draft FS model runs project a change of 70 ppb in that same area over 30 or 45 years, it is unlikely that the variations in residual calculations would change the conclusion substantially for that area for that alternative.

CONCLUSION

Both the dredge production and dredge residuals proposals in this memorandum provide a specific method to incorporate detailed information regarding EPA's concerns in the revised FS that will support conclusions about remedial effectiveness (and other Superfund FS criteria) through a quantitative range evaluation. This has the added benefit of not requiring wholesale revision of every existing alternative in the draft FS. If EPA is amenable to these proposals, more detailed methods for the calculations for each range evaluation or example evaluation outputs can be provided by the LWG, as necessary.

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